Improve Outcome through Sleep Apnea Management Integration into Cardiac Care Pathway

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http://www.itamar-medical.com/

Simplicity of Pulse Oximetry, Accuracy of PSG

WatchPAT™

Home Sleep Testing Made Simple

Powered by the PAT® technology

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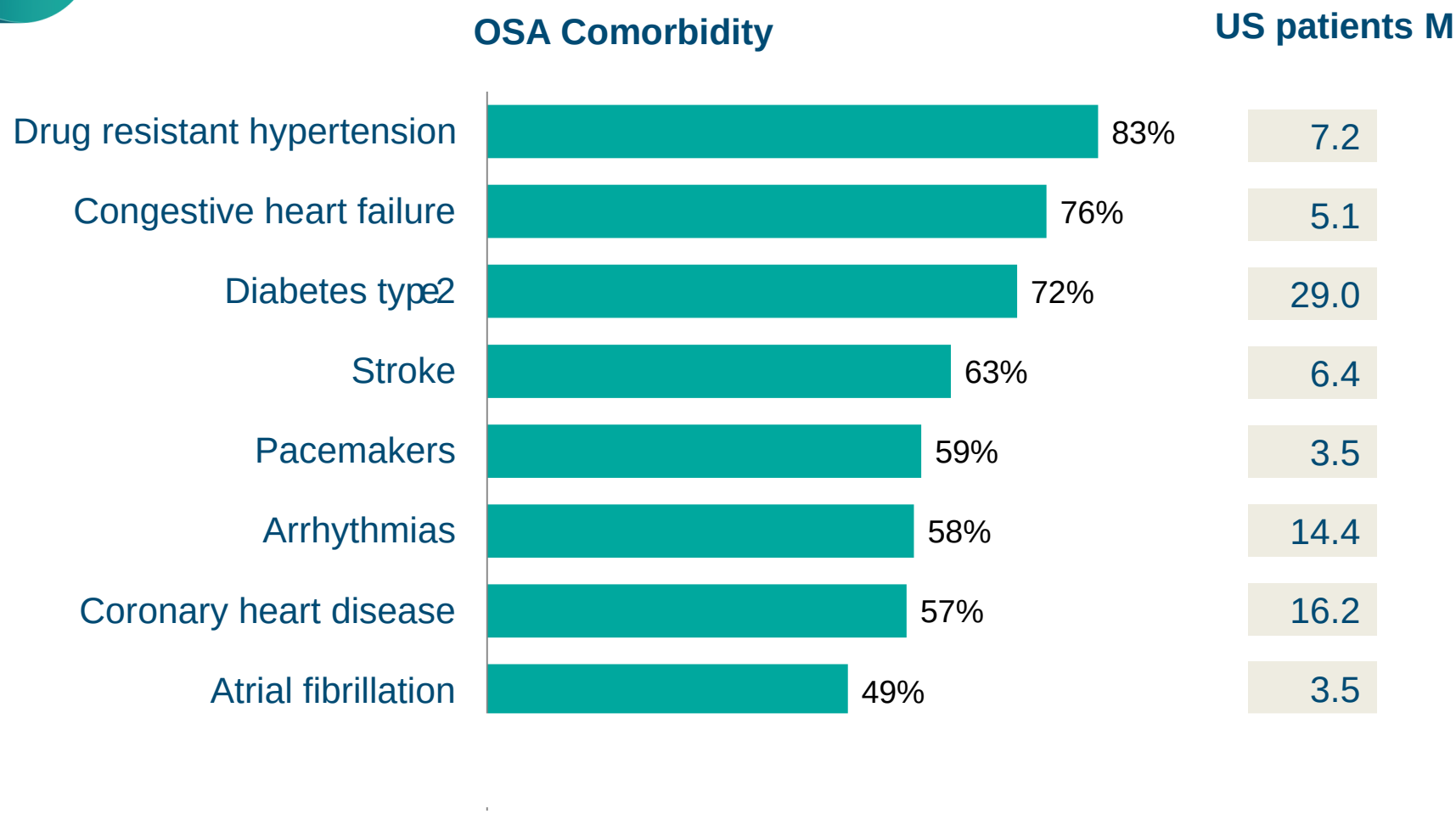
Simple, Accurate, Fast and Reliable

The Most Studied Home Sleep Test Available

Clinically Validated to Have 90% Correlation to In-Lab PSG

Measures "Total Sleep Time™" and Complete Sleep Architecture

Sleep Apnea - a Significant Comorbidity to Most Cardiac Disease



- Source: Seet & Chung, Anestsiology Clin 2010

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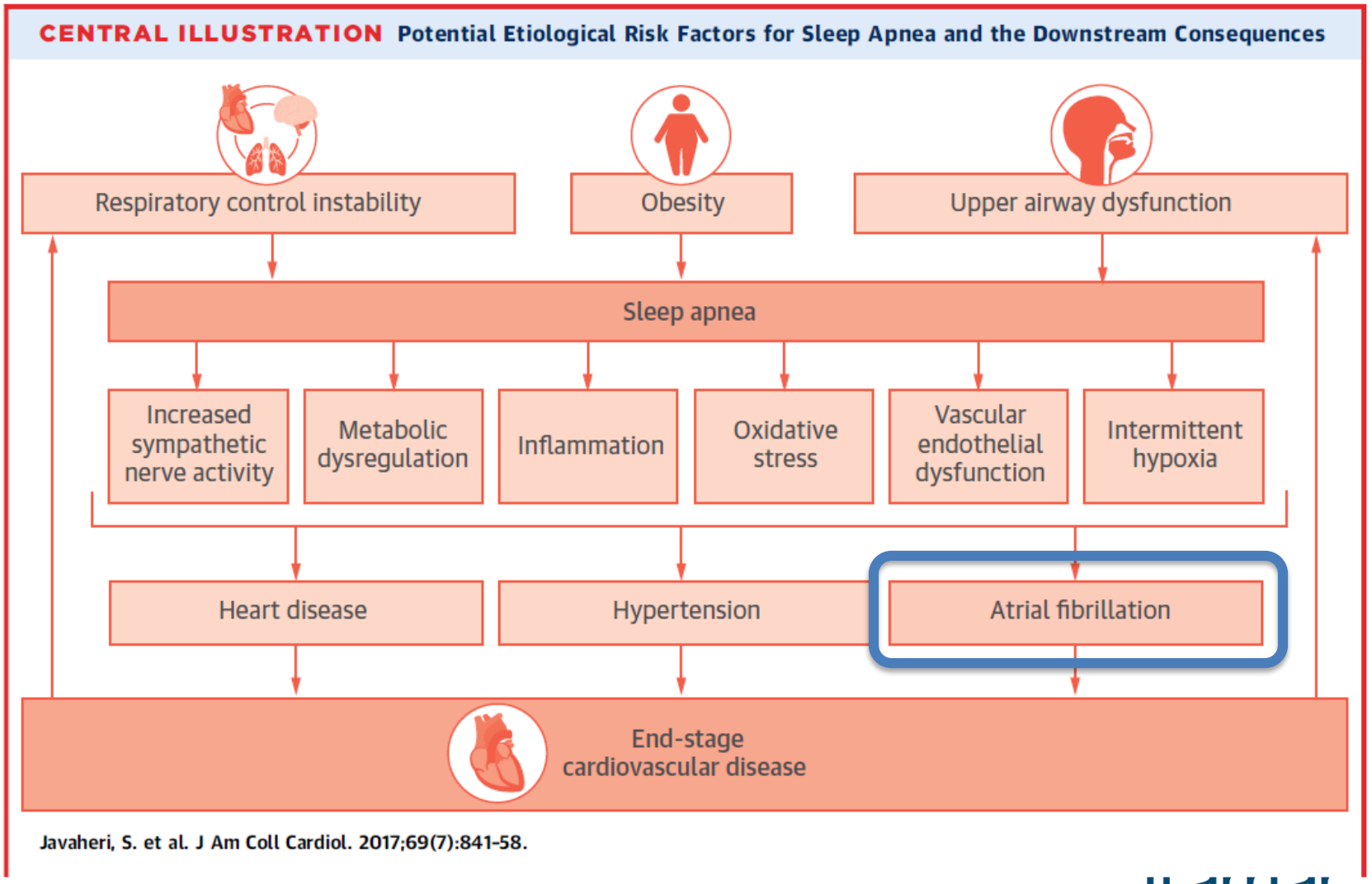
2017 - A turning point in the cardiology market
Science and Guidelines



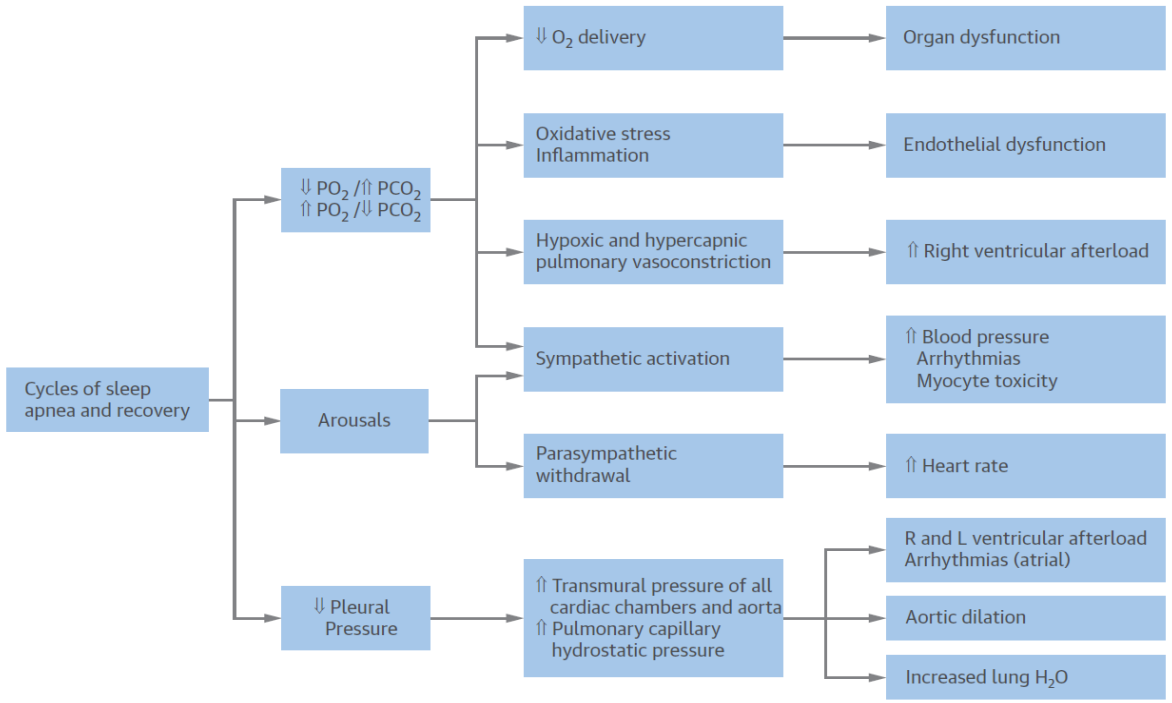
Javaheri, S. et al. J Am Coll Cardiol. 2017;69(7):841-58.

Sleep Apnea

Types, Mechanisms, and Clinical Cardiovascular Consequences

Shahrokh Javaheri, MD,[a] Ferran Barbe, MD,[b] Francisco Campos-Rodriguez, MD,[c] Jerome A. Dempsey, PhD,[d] Rami Khayat, MD,[e] Sogol Javaheri, MD,[f] Atul Malhotra, MD,[g] Miguel A. Martinez-Garcia, MD,[h] Reena Mehra, MD,[i] Allan I. Pack, MBChB, PhD,[j] Vsevolod Y. Polotsky, MD,[k] Susan Redline, MD,[f,l] Virend K. Somers, MD, PhD[m]

FIGURE 4 Pathophysiological Consequences of Sleep Apnea and Hypopnea



Pleural pressure (Ppl) is a surrogate of the pressure surrounding the heart and other vascular structures. ↑ = increased; ↓ = decreased. Reprinted with permission from Javaheri (8). CV = cardiovascular; H_2O = water; L = left; O_2 = oxygen; PCO_2 = partial pressure of carbon dioxide in the blood; PO_2 = partial pressure of oxygen in the blood; R = right.

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Why Sleep Apnea Hurts Hearts

Associations of Obstructive Sleep Apnea With Atrial Fibrillation and Continuous Positive Airway Pressure Treatment A Review`

Dominik Linz, MD, PhD; R. Doug McEvoy, MD; Martin R. Cowie, MD; Virend K. Somers, MD, PhD; Stanley Nattel, MD; Patrick L'vy,MD, PhD; Jonathan M Kalman, MBBS, PhD; Prashanthan Sanders, MBBS, PhD

JAMA
The Journal of the American Medical Association

Box. Characteristics of Atrial Fibrillation

Attributes of Obstructive Respiratory Events

Intrathoracic pressure changes
- Increase in atrial stretch
- Increase in transmural pressure gradients

Changes in blood gases
- High-frequency desaturation and resaturation
- Oxidative stress

Autonomic nerve system changes
- Vagal activation (diving reflex)
- Sympathetic activation (arousal)
- Sympathovagal activation

Acute Apnea-Associated Arrhythmogenic Changes

Acute atrial dilation

Sympathovagal activation

High-frequency desaturation and reoxygenation

Acute shortening in atrial refractoriness

Atrial extrasystole (trigger)

Intermittent conduction delay

Atrial Remodeling in Long-term OSA

Atrial stretch

Neurohumoral activation and oxidative stress

Progressive structural remodeling

Regional conduction slowing and reentry

Concomitant conditions (hypertension, obesity, metabolic syndrome)

Current Clinical Practice Recommendations

Interrogation for clinical symptoms of OSA and screening for OSA in all patients diagnosed with AF (class IIa, level B^3/class 2A, level B-R^{29}), particularly those considered for a rhythm control strategy.

Sleep study evaluation may be reasonable in patients with AF who do not report daytime sleepiness.[51,52]

Initiation of continuous positive airway pressure treatment to reduce AF recurrences and improve AF treatment results (class IIa, level B^3/class 2A, level B-R^{29})

Diagnostic and Therapeutic Uncertainties and Controversies

Do randomized clinical trials confirm that treatment of OSA prevents incident and recurrent AF?

What level of severity of sleep apnea should be used to determine the need for treatment?

Is AHI the best parameter to determine OSA-severity and guide to decide which patients with AF require treatment?

Does position-dependent OSA with apneas just in the supine position represent a treatment target in patients with AF?

What is the role of CPAP treatment in older patients with AF?

Should other sleep-related abnormalities, such as nocturnal periodic limb movements, be further evaluated and treated in patients with AF?

Abbreviations: AF, atrial fibrillation; AHI, Apnea Hypopnea Index; OSA, obstructive sleep apnea.

Treatment of OSA Reduces AFib Recurrence Post Ablation

JACC: CLINICAL ELECTROPHYSIOLOGY
VOL. 1, NO. 1-2, 2015

ISSN 2405-500X/$36.00
PUBLISHED BY ELSEVIER INC.
http://dx.doi.org/10.1016/j.jacep.2015.02.014

Effect of Obstructive Sleep Apnea Treatment on Atrial Fibrillation Recurrence

A Meta-Analysis

Ashish Shukla, MD, MPH, Anthony Aizer, MD, MSc, Douglas Holmes, MD, Steven
David S. Park, MD, PhD, Scott Bernstein, MD, Neil Bernstein, MD, Larry Chinitz,

ABSTRACT

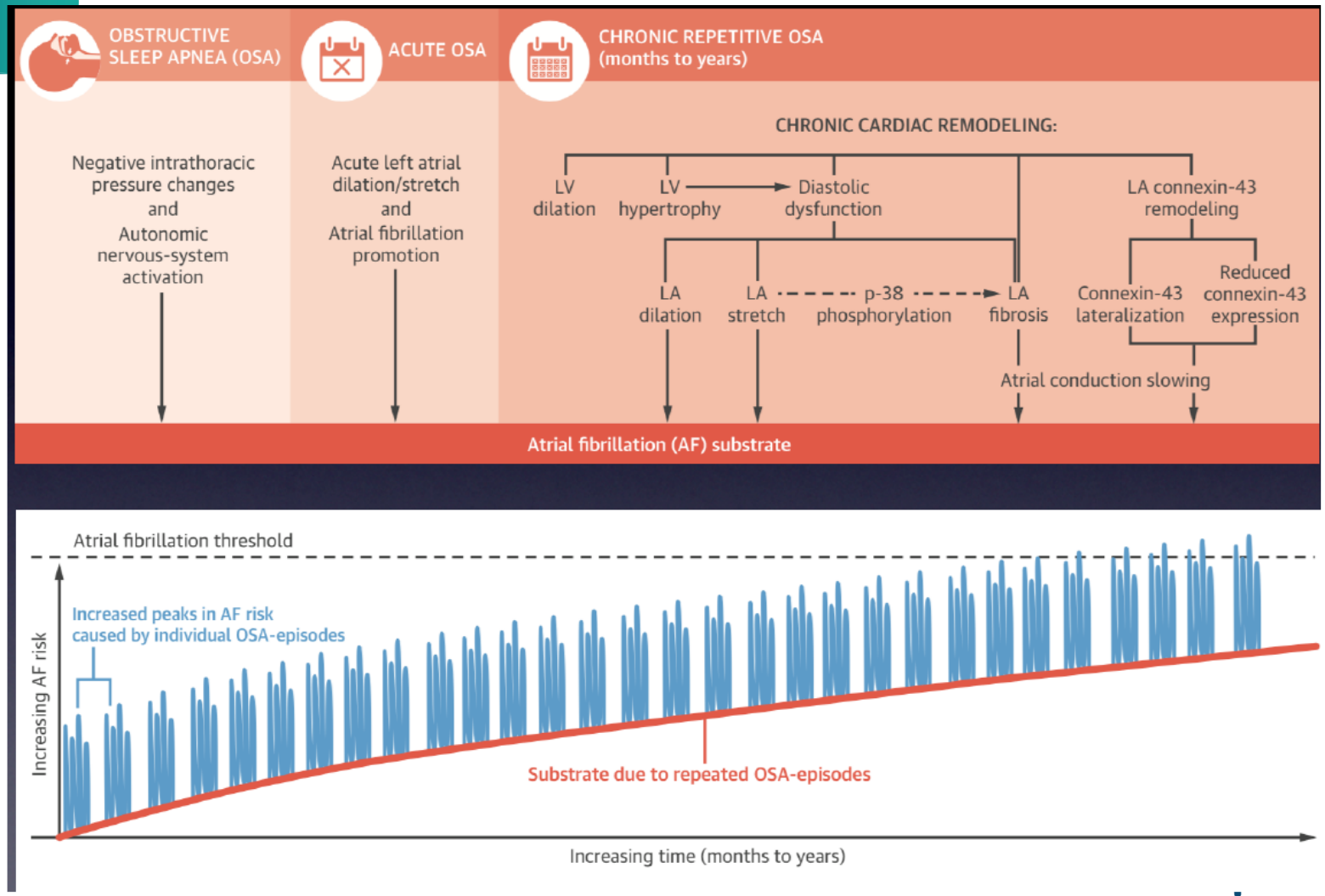
OBJECTIVES This study aimed to evaluate the cumulative effect of treatment of ob
continuous positive airway pressure (CPAP) on atrial fibrillation (AF) recurrence.

CONCLUSIONS

The use of CPAP is associated with a 42% relative risk reduction in AF recurrence in patients with OSA. This reduction of AF recurrence appears to be independent of medical or catheter ablation therapy and is consistent across patient groups with OSA. These results advocate for active screening for undiagnosed OSA in patients with AF when OSA is clinically suspected. The use of CPAP offers to be the third potential treatment option for AF (in addition to medical therapy and PVI), and although results from RCTs may be warranted to understand the true extent of its efficacy, its use and adherence needs to be promoted aggressively in these patient groups.

See Video of Prof. Chintz: https://www.youtube.com/watch?v=stx3yXKLN4c&feature=youtu.be

Why you should Care now?



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OSA impact Cardioversion Outcome

MAYO CLINIC

Circulation
JOURNAL OF THE AMERICAN HEART ASSOCIATION

American Heart Association®
Learn and Live™

Ravi Kanagala, Narayana S. Murali, Paul A. Friedman, Naser M. Ammash, Bernard J. Gersh, Karla V. Ballman, Abu S. M. Shamsuzzaman and Virend K. Somers

The recurrence rate of AF at 12 months in the 27 untreated or inappropriately treated subjects with OSA was **82% vs. 42%** in the treated OSA group (*P*0.013)

***Circulation*. 2003;107:2589-2594.)**

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OSA and AFib – a Systematic Approach: a Consensus in the Making

AF SYMPOSIUM 2016
JANUARY 14th-16th

Prof. Hugh Calkins, chairman of the AFib task force by HRS/AHA/ESC
Director of the Electrophysiology Laboratory and Arrhythmia Service at Johns Hopkins Hospital

There is clear evidence demonstrating OSA to be a significant risk factor for AF. In addition, treatment of OSA is an important component of AF management, particularly when cardioversion or PVI is used. **The strength of the evidence warrants consideration of routine clinical screening for OSA prior to use of a rhythm control strategy.**

Sleep Review
THE JOURNAL FOR SLEEP SPECIALISTS

Prof. Babak Mokhlesi,
Director of the University of Chicago's
Sleep Disorder Center

Electrophysiologists are increasingly acknowledging the link between atrial fibrillation and sleep apnea. At the University of Chicago sleep physicians work with heart rhythm specialists in a new care model that could improve patient outcomes.

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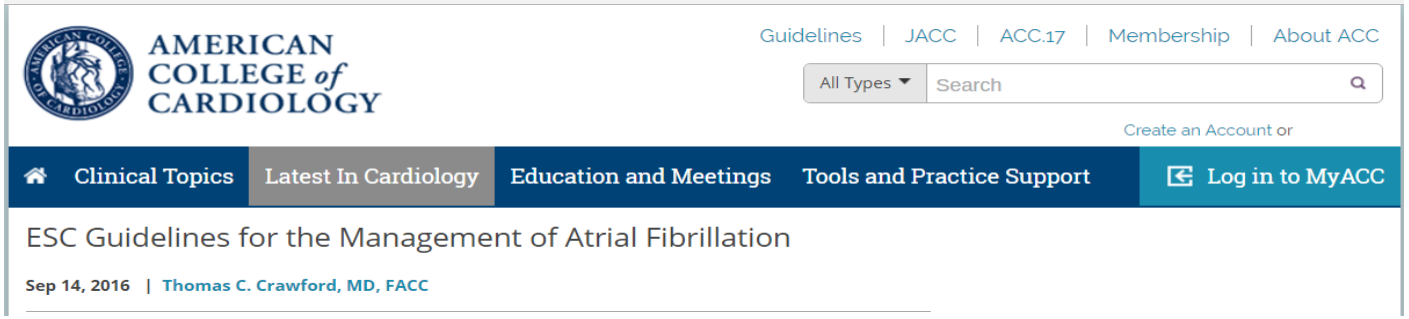
ACC Quote of the ESC Guidelines



Authors: Kirchhof P, Benussi S, Kotecha D, et al.

Interrogation for clinical signs of obstructive sleep apnea should be considered in all AF patients (Class IIa, Level of Evidence B). Obstructive sleep apnea treatment should be optimized to reduce AF recurrences and improve AF treatment results (Class IIa, Level of Evidence B)

•**2a:** Systematic reviews (with homogeneity) of cohort studies

•**Level B**: At least fair scientific evidence suggests that the benefits of the clinical service outweighs the potential risks. Clinicians should discuss the service with eligible patients.

See more at:
http://www.acc.org/sitecore/content/Sites/ACC/Home/Latest-in-Cardiology/ten-points-to-remember/2016/09/14/14/33/2016-ESC-Guidelines-for-the-Management-of-Atrial-Fibrillation#sthash.yId4UIzK.dpuf

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HRS Expert Consensus Statement 2017

2017 HRS/EHRA/ECAS/APHRS/SOLAECE expert consensus statement on catheter and surgical ablation of atrial fibrillation: Executive summary

It is reasonable to screen for signs and symptoms of sleep apnea when evaluating a patient for an AF ablation procedure and to recommend a sleep evaluation if sleep apnea is suspected.
Treatment of sleep apnea can be useful for patients with AF, including those who are being evaluated to undergo an AF ablation procedure.

H. Calkins et al. / Journal of Arrhythmia 33 (2017) 369–409

AASM 2017 campaign

- **Sleep apnea hurts HEARTS by increasing the risk of:**
-

  H - heart failure
  E - elevated blood pressure
  A - atrial fibrillation (A-fib)
  R - resistant hypertension
  T - Type 2 diabetes
  S - stroke

  Damage Control

- The good news is that the effective treatment of sleep apnea is good for your sleep and your heart! Treatment with CPAP therapy improves your overall health and lowers your risk of heart problems.

http://www.sleepeducation.org/healthysleep/sleep-apnea-hurts-hearts

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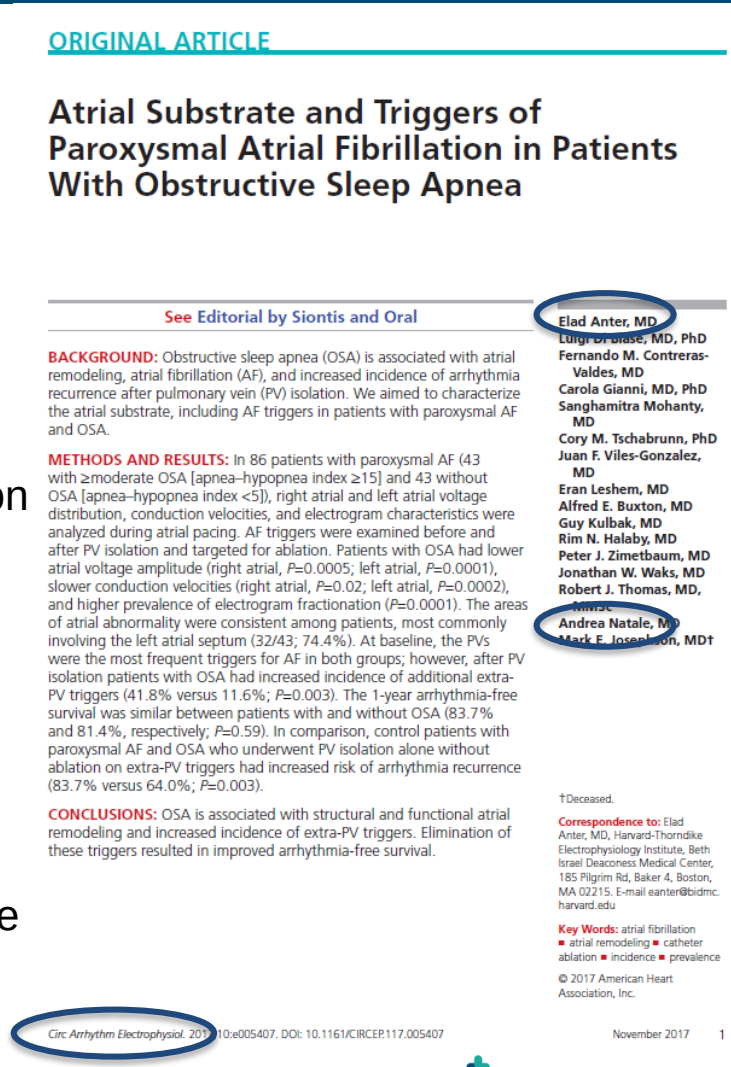
OSA May Define Ablation Strategy

- Prospective Multi-Center Study led by Dr. Elad Anter of Beth Israel Deaconess , Harvard, Boston
- Other KOL author: Dr. Andrea Natale, Austin and Dr. Juan Viles-Gonzalez , Uni of Miami
- Published in “Circulation Arrhythmia” – a well respected EP medical journal

- 86 patients, Paroxysmal AF (PAF) , 50% with OSA (AHI≥15) that undergo PVI + Non-PV Triggers ablation
- Additional retrospective 2 control groups (with OSA and without OSA) that had just PVI
- All 4 groups Underwent full substrate evaluation with 3D mapping and ablation

- Conclusion:

OSA is associated with structural and functional atrial remodeling and more non-PV triggers elimination of those triggers improve ablation outcome



ORIGINAL ARTICLE

Atrial Substrate and Triggers of Paroxysmal Atrial Fibrillation in Patients With Obstructive Sleep Apnea

See Editorial by Siontis and Oral

Elad Anter, MD
Luigi Di Biase, MD, PhD
Fernando M. Contreras-Valdes, MD
Carola Gianni, MD, PhD
Sanghamitra Mohanty, MD
Cory M. Tschabrunn, PhD
Juan F. Viles-Gonzalez, MD
Eran Leshem, MD
Alfred E. Buxton, MD
Guy Kulbak, MD
Rim N. Halaby, MD
Peter J. Zimetbaum, MD
Jonathan W. Waks, MD
Robert J. Thomas, MD,
Andrea Natale, MD
Mark E. Josephson, MD†

BACKGROUND: Obstructive sleep apnea (OSA) is associated with atrial remodeling, atrial fibrillation (AF), and increased incidence of arrhythmia recurrence after pulmonary vein (PV) isolation. We aimed to characterize the atrial substrate, including AF triggers in patients with paroxysmal AF and OSA.

METHODS AND RESULTS: In 86 patients with paroxysmal AF (43 with ≥moderate OSA [apnea–hypopnea index ≥15] and 43 without OSA [apnea–hypopnea index <5]), right atrial and left atrial voltage distribution, conduction velocities, and electrogram characteristics were analyzed during atrial pacing. AF triggers were examined before and after PV isolation and targeted for ablation. Patients with OSA had lower atrial voltage amplitude (right atrial, *P*=0.0005; left atrial, *P*=0.0001), slower conduction velocities (right atrial, *P*=0.02; left atrial, *P*=0.0002), and higher prevalence of electrogram fractionation (*P*=0.0001). The areas of atrial abnormality were consistent among patients, most commonly involving the left atrial septum (32/43; 74.4%). At baseline, the PVs were the most frequent triggers for AF in both groups; however, after PV isolation patients with OSA had increased incidence of additional extra-PV triggers (41.8% versus 11.6%; *P*=0.003). The 1-year arrhythmia-free survival was similar between patients with and without OSA (83.7% and 81.4%, respectively; *P*=0.59). In comparison, control patients with paroxysmal AF and OSA who underwent PV isolation alone without ablation on extra-PV triggers had increased risk of arrhythmia recurrence (83.7% versus 64.0%; *P*=0.003).

CONCLUSIONS: OSA is associated with structural and functional atrial remodeling and increased incidence of extra-PV triggers. Elimination of these triggers resulted in improved arrhythmia-free survival.

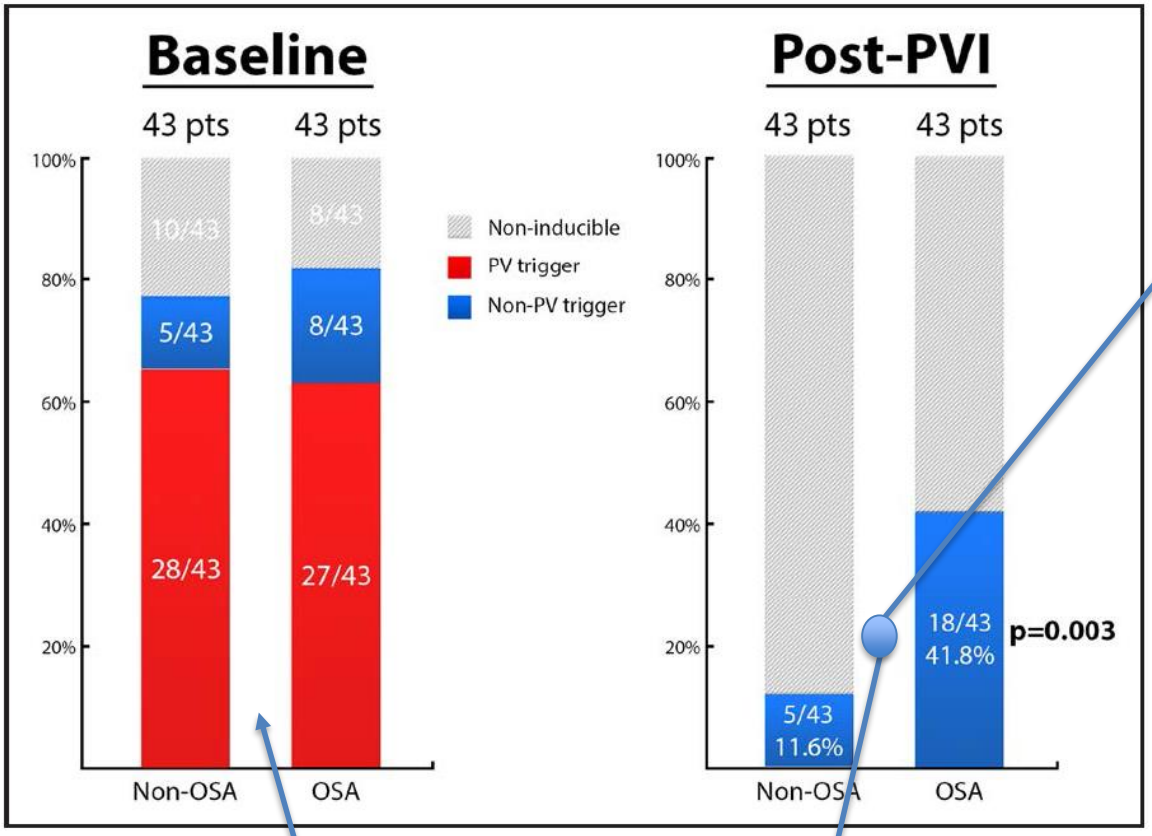
†Deceased.

Correspondence to: Elad Anter, MD, Harvard-Thorndike Electrophysiology Institute, Beth Israel Deaconess Medical Center, 185 Pilgrim Rd, Baker 4, Boston, MA 02215. E-mail eanter@bidmc.harvard.edu

Key Words: atrial fibrillation ■ atrial remodeling ■ catheter ablation ■ incidence ■ prevalence

Circ Arrhythm Electrophysiol. 2017;10:e005407. DOI: 10.1161/CIRCEP.117.005407 November 2017 1

OSA May Define Ablation Strategy



Overall, elimination of APD-triggered AF was achieved in 19 of 23 (82.6%), whereas in 4 of 23 (17.4%) elimination of APD-induced AF could not be achieved. The additional ablation time required for elimination of extra-PV triggers was 11 minutes [median, 12 minutes; range, 3–18 minutes]. Ablation of extra-PV triggers was not associated with additional complications.

Figure 5. Distribution of atrial fibrillation (AF) triggers in patients with and without obstructive sleep apnea (OSA).
PVI indicates pulmonary vein isolation.

Before Ablation - no difference

After Ablation – OSA has 40% non-PV triggers

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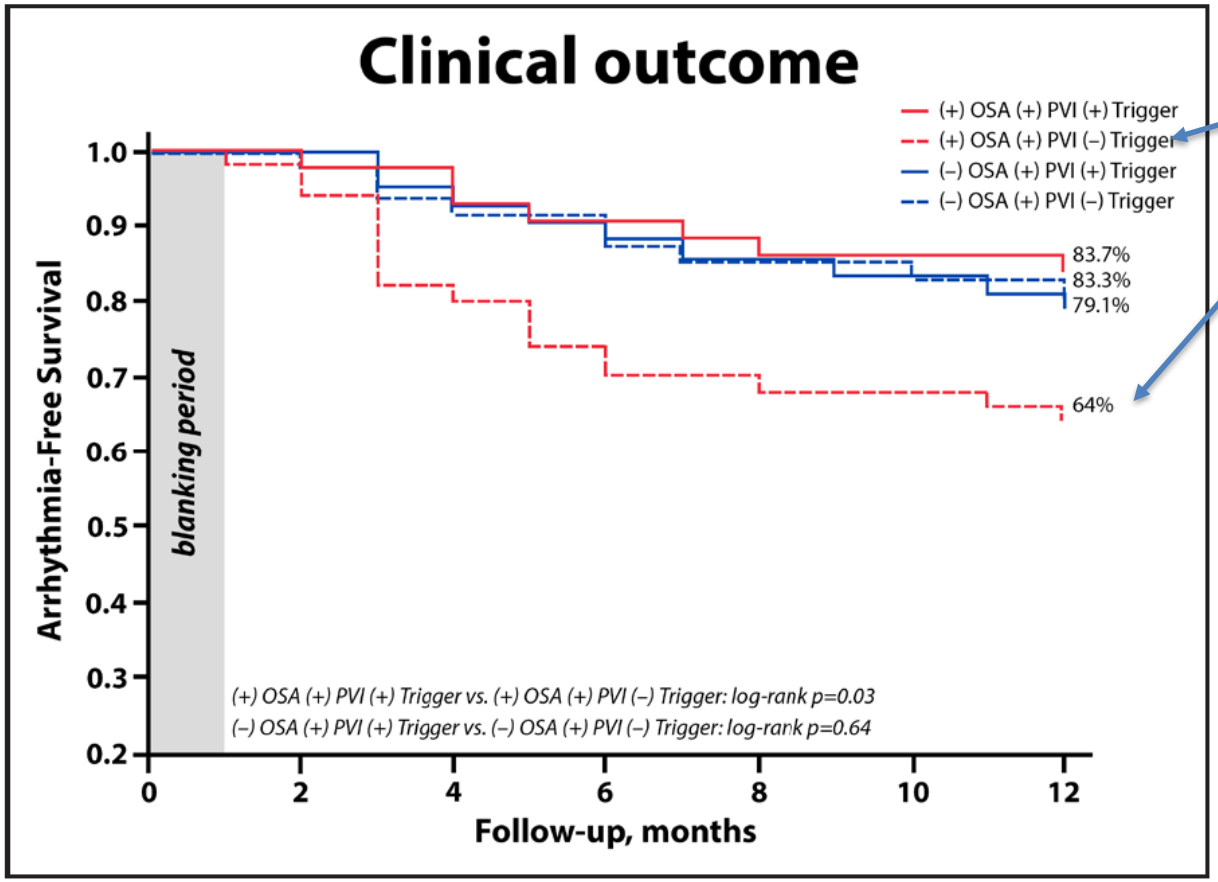
OSA May Define Ablation Strategy



Pts with OSA
That undergo PVI only

Figure 7. Kaplan–Meier survival curves according to treatment groups.
OSA indicates obstructive sleep apnea; and PVI, pulmonary vein isolation.

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WP was validated for AF patients

WatchPAT is accurate in the diagnosis of Obstructive sleep apnea in the presence of atrial fibrillation

Giora Pillar[1], Tamar Etzioni[1], Anil Rama[2], Prasanth Manthena[3], Murray Berall[4], Riva Tauman[5], Yaakov Henkin[6], Marai Ibrahim[7], and Thomas Penzel[8]

(1) Sleep Lab, Carmel Hospital and Technion Faculty of Medicine, Haifa, Israel; (2) Sleep clinic, Kaiser Permanente San Jose Medical Center, CA, USA; (3) Sleep clinic, Kaiser Permanente Los Angeles Medical Center, CA, USA; (4) Centre for Sleep and Chronobiology, Toronto, ON, Canada; (5) Sleep Disorders Center, Tel Aviv Medical Center, Tel Aviv University, Tel Aviv, Israel; (6) Cardiology department, Soroka Medical Center, Beer Sheva, Israel; (7) Cardiology department, Rambam Medical Center, Haifa, Israel; (8) Charite Universitätsmedizin Berlin, Germany.

Introduction

The WatchPAT is a Home Sleep Testing (HST) device which has been shown to be accurate for diagnosing sleep disordered breathing (SDB). It is based on Peripheral Arterial Tone (PAT) signal's amplitudes and rate, oxygen saturation and actigraphy. Studies so far excluded patients with arrhythmias as the potential effect on PAT amplitude and rate changes had not been validated.

Purpose

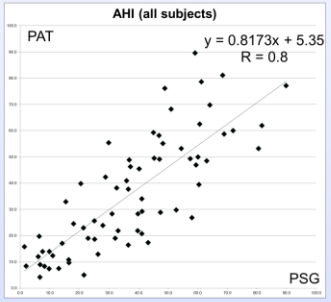
To examine the accuracy of the WatchPAT in detecting SDB in patients with atrial fibrillation (AF).

Methods

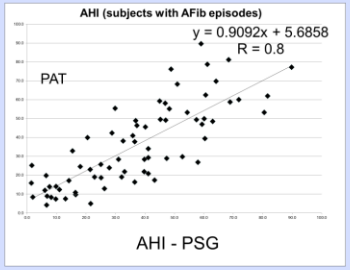
- 69 patients (51 males) previously diagnosed with AF (persistent or paroxysmal) with suspected SDB
- Age 69±10 years.
- Simultaneous recording of full night in-lab polysomnography (PSG) and WatchPAT (Itamar-Medical, Caesarea, Israel), in 8 centers.
- PSG scoring was performed by experienced PSG technologists, blinded to the automatic scoring of the WatchPAT

Results

Of the 69 patients, 26 had AF throughout the night, 9 had AF episodes part of the night, and 34 had no AF events during the night. The presence of AF episodes did not cause significant non-valid PAT signal. Using a threshold AHI ≥ 15, the sensitivity and specificity of the WatchPAT for all 69 patients were 0.93 and 0.77, respectively. The correlation between AHI assessed by PSG and by WatchPAT for all 69 patients, for the subgroup of 35 patients with AF events and for the 26 patients with AF throughout the night were 0.8, p<0.01 for all. The overall accuracy in sleep staging between WatchPAT and PSG based on an epoch-by-epoch comparison was 62% (compared to the previously reported 65% in the general population). Kappa agreement was 0.41 (compared to the previously reported 0.47 in general population).



•High Pearson correlation between PSG AHI and PAT AHI of 0.80 (p<<0.01) with a slope of 0.82.



•High Pearson correlation between PSG AHI and PAT AHI of 0.80 (p<<0.01) with a slop of 0.9.

Conclusions

These findings support our hypothesis that WatchPAT can accurately detect SDB events in patients with AF, and that AF should not be an exclusion criterion for using this device

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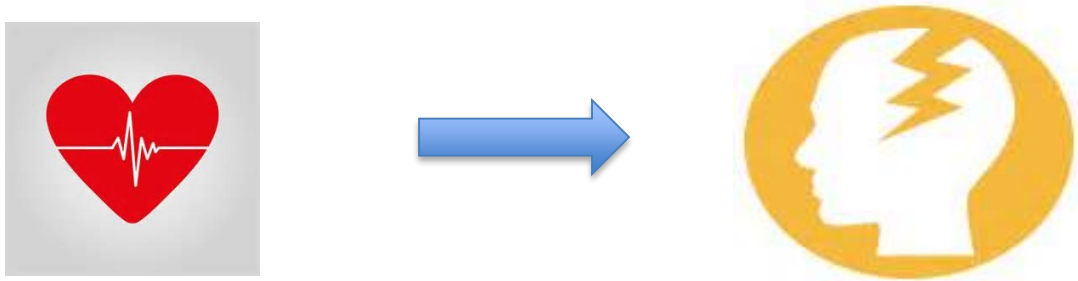
To What Diseases we have evidence ?

Expand to A.Fib and Stroke



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A.Fib, OSA and Stroke

The American Journal of Cardiology

Effect of Obstructive Sleep Apnea on Frequency of Stroke in Patients With Atrial Fibrillation

Dmitry M. Yaranov, MD[a,*], Athanasios Smyrlis, MD[b], Natalia Usatii, MD[a], Amber Butler, BS[c], Joann R. Petrini, PhD, MPH[c], Jose Mendez, MD[d], and Mark K. Warshofsky, MD[b]

Among the study population, the occurrence of first-time stroke was 22.9%. Ischemic stroke was more common in patients with OSA compared with patients without (**25.4% vs 8.2%** respectively, p [0.006])

Danbury Hospital, Western Connecticut Health Network, November 17, 2014.

The American Journal of Cardiology (www.ajconline.org)

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2017 ACC/AHA Hypertension Guidelines

Highlights FROM THE 2017 GUIDELINE FOR THE PREVENTION, DETECTION, EVALUATION AND MANAGEMENT OF HIGH BLOOD PRESSURE IN ADULTS

A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

New blood pressure targets and treatment recommendations: For years, hypertension was classified as a blood pressure (BP) reading of 140/90 mm Hg or higher, but the updated guideline classifies hypertension as a BP reading of 130/80 mm Hg or higher. The updated guideline also provides new treatment recommendations, which include lifestyle changes as well as BP-lowering medications, as shown in Table 1.

11. Other Considerations

11.1. Resistant Hypertension

Figure 10. Resistant Hypertension: Diagnosis, Evaluation, and Treatment

Screen for secondary causes of hypertension‡

Primary aldosteronism (elevated aldosterone/renin ratio)

CKD (eGFR <60 mL/min/1.73 m^2)

Renal artery stenosis (young female, known atherosclerotic disease, worsening kidney function)

Pheochromocytoma (episodic hypertension, palpitations, diaphoresis, headache)

Obstructive sleep apnea (snoring, witnessed apnea, excessive daytime sleepiness)

To What Diseases we have evidence ?

Expand to CV and all cause mortality

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OSA Therapy Reduces Cardiovascular Mortality

Meta-analysis of all-cause and cardiovascular mortality in obstructive sleep apnea with or without continuous positive airway pressure treatment

Yiqun Fu [1,2,3] · Yunyan Xia [1,2,3] · Hongliang Yi [1,2,3] · Huajun Xu [1,2,3] · Jian Guan [1,2,3] · Shankai Yin [1,2,3]

both all-cause mortality and cardiovascular mortality. Patients with severe OSA had a 113 % risk for all-cause mortality and a 173 % risk for cardiovascular mortality. CPAP treatment significantly reduced both all-cause and cardiovascular mortality in patients with OSA. Indeed, CPAP-treated OSA patients were not significantly different from normal control subjects

Sleep Breath
DOI 10.1007/s11325-016-1393-1
Published online: 08 August 2016

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Widely held notions may not be correct each time

"When I see a patient, I can immediately guess if the patient has OSA or not, even the severity level"

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Cardiovascular Investigations: Open Access

2017
Vol.1 No.1:1

Wide Screening of Obstructive Sleep Apnea in a Cardiology Clinic

Lynn Zaremski* and Ronald Wharton

Department of Cardiology, Montefiore Medical Center, 3444 Kossuth Ave, Bronx, New York

***Corresponding author:** Lynn Zaremski, Department of Cardiology, Montefiore Medical Center, 3444 Kossuth Ave, Bronx, NY 10467, Tel: 718-920-2273; E-mail: lzaremsk@montefiore.org

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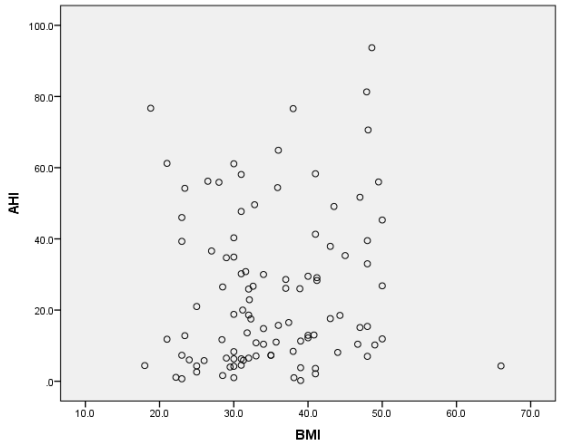
Citation: Zaremski L, Wharton R. Wide Screening of Obstructive Sleep Apnea in a Cardiology Clinic. Cardiovasc Investig. 2017, 1: 1.



- Body habitus is not correlated with OSA. **BMI is not an indicator for OSA presence or severity**
- **More severe OSA** accompanies **more comorbidities**
- OSA is highly prevalent in **high risk patients**
  - Heart failure patients
  - Hypertension patients
  - Diabetic patients

Wide screening should employed in high risk population

Itamar solved it:

Move to Dx and TX point of care into Cardiology

“Closet model”

itamar medical | Health Being Made Simple

Strategy Implementation - a unique comprehensive solution that enables diagnosis and treatment

Total Sleep Solution™

Screening

Diagnosing

Treatment

Reporting

Itamar provides cardiologists with a comprehensive sleep solution, combining diagnostics and therapy

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Patient Care Pathway Control

Sleep Apnea Dashboard

Dr. Xxxx Xxxx

Sleep Apnea Screening	SA Positive Screening	Home Sleep Tested	SA Prevalence	CPAP Treatment	CPAP Compliance
95%	87%	75%	62%	53%	70%

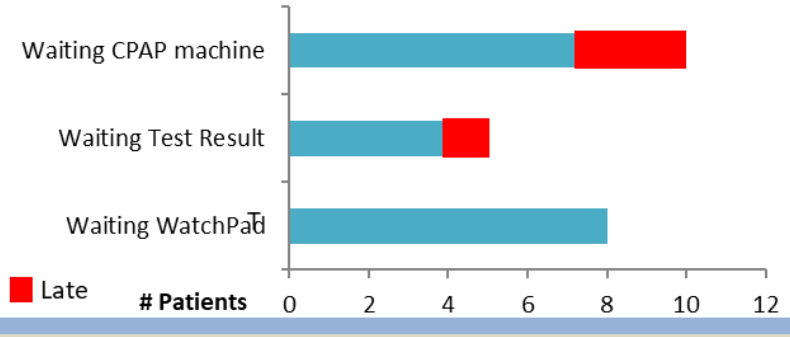
Enrolled # Patient

346

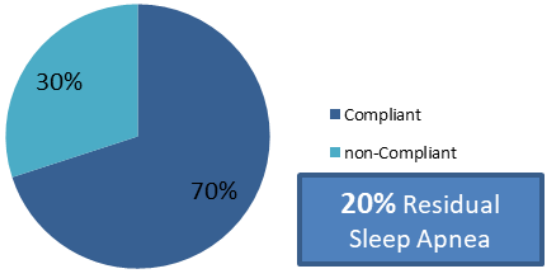
Select Period

- ❑ 1 week
- ❑ 2 week
- ❑ 1 month
- ❑ 3 months
- ❑ 6 months
- ❑ 12 months
- ❑ 24 months
- ❑ 36 months

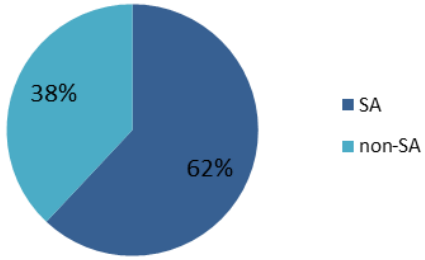
Waiting List



CPAP Compliance



Sleep Apnea Prevalence



Sleep Apnea Screening Rate

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AASM Guidelines and Reimbursement Project

PUBLISHED

JCSM
Journal of Clinical Sleep Medicine

SPECIAL ARTICLES

Clinical Practice Guideline for Diagnostic Testing for Adult Obstructive Sleep Apnea: An American Academy of Sleep Medicine Clinical Practice Guideline

Vishesh K. Kapur, MD, MPH[1]; Dennis H. Auckley, MD[2]; Susmita Chowdhuri, MD[3]; David C. Kuhlmann, MD[4]; Reena Mehra, MD, MS[5]; Kannan Ramar, MBBS, MD[6]; Christopher G. Harrod, MS[7]

[1]University of Washington, Seattle, WA; [2]MetroHealth Medical Center and Case Western Reserve University, Cleveland, OH; [3]John D. Dingell VA Medical Center and Wayne State University, Detroit, MI; [4]Bothwell Regional Health Center, Sedalia, MO; [5]Cleveland Clinic, Cleveland, OH; [6]Mayo Clinic, Rochester, MN; [7]American Academy of Sleep Medicine, Darien, IL

Dr. Nancy Collop
Editor-in-Chief — Sleep Medicine

A technically adequate HSAT device incorporates a minimum of the following sensors: nasal pressure, chest and abdominal respiratory inductance plethysmography, and oximetry; or else PAT with oximetry and actigraphy. For additional information regarding HSAT sensor requirements, refer to The AASM Manual for the Scoring of Sleep and Associated Events.[24]

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